Section VII. Technical Specifications

TERMS OF REFERENCE			
GENERAL REQUIREMENTS			
Supply, Delivery, Installation, Testing & Commissioning of **Ultraviolet Hydro Optic Disinfection System**			
5 Units Ultra-Violet Disinfection System			
A. SPECIFICATIONS PER UV EQUIPMENT UNIT:			**Statement of Compliance**
RZ300 – 12 (4 UNITS FOR UPPER BUCAL)			
Discharge Pipe Size	:	14" Diameter (350mm)	
Max. Flow Capacity	:	500 m^3/hr. at 120 mJ/cm^2	
Type & Minimum Lamp Capacity	:	4.2Kw UV Medium Pressure High Intensity	
No. of Lamp/min. capacity	:	2 x 4.2Kw	
Max. Operating Pressure	:	7 bar	
Water Operating Temp.	:	Up to 60 °C	
Electrical Requirements	:	3-Phase x 400/380VAC (Wye-Connected) for the Ballast Module (Lamp) and 1-Phase x 110x220 VAC for the Controller	
Maximum Power Consumption	:	8.4Kw	
RZ163 – 12 (1 UNIT FOR LOWER BUCAL)			
Discharge Pipe Size	:	6" Diameter (150mm)	
Max. Flow Capacity	:	400 m^3/hr. at 60 mJ/cm^2	
Type & Minimum Lamp Capacity	:	1.7 Kw UV Medium Pressure High Intensity	
No. of Lamp/min. capacity	:	2 x 1.7 Kw	
Max. Operating Pressure	:	10 bar	
Water Operating Temp.	:	Up to 60 °C	
Electrical Requirements	:	3-Phase x 400/380VAC (Wye-Connected) for the Ballast Module (Lamp) and 1-Phase x 110x220 VAC for the Controller	
Maximum Power Consumption	:	3.4 Kw	
Construction Materials:			
Housing	:	Stainless Steel 316	
Internals	:	High grade fused silica quartz	
Real Time Tracking & Monitoring:			
• Two (2) sensors per lamp to continuously measure 3 parameters that effect UV Dose in real time (UV Transmittance, Lamp Power/Status & Flow rate).			
• Control System capable of automatically adjusting lamp power.			
• The unit should provide minimum dose required.			
• Full exception reporting, alarm & alerts, security suite.			
• Real-time monitoring			
• Real-time status display of critical parameters			
B. ULTRAVIOLET DISINFECTION CHAMBER (Chamber & UV Lamps)			
1) Internal Quartz tube material shall be used as the main disinfection chamber. All the influent water must flow through the quartz disinfection chamber from one side of the reactor to the next. Quartz chamber shall be capable of reflecting light within the disinfection zone. A 316 stainless steel casing shall be used solely as a protective casing around the main quartz chamber.			

2) The UV system shall be equipped with Medium Pressure, High Intensity Lamps and shall be enclosed within a quartz sleeve that is no less than 5 mm thick. Each lamp shall guarantee 100 percent treatment of the water flow traveling through each UV System.	
3) The UV system shall be able to automatically adjust the power consumption between 40%-100% depending on demand and still give 100 percent disinfection.	
4) The system shall have a UV intensity sensor per lamp. The UV intensity sensor views and monitors the UV intensity directly with no other medium in between. Each UV intensity sensor shall be connected to the master control of the UV system.	
5) The system should have a UV Transmittance (UVT) Sensor per 2 lamps that is integrated within the UV chamber. The UVT sensor should be connected to the system controller inline and provide the UVT for the validated dose pacing algorithm.	
C. POWER / CONTROL MODULE / MONITORING	
1) Each power supply (ballast) shall independently operate one lamp that is capable of 40-100 percent adjustability.	
2) All power supply, UV intensity, UVT analyzer and flow meters should be operated by a single controller with a touch screen which is capable to display and control the following parameters: • Flowrate • UV Dose (in mJ/cm2) • Lamp life and efficiency for each individual lamp. • Power output of the Power Supply (ballast) • Specific Screens for calibrating UVT and UV intensity sensors.	
3) Each control Module shall have built-in automated programmed capability to operate in Dose Mode.	
D. DOSAGE	
1) The UV system shall provide the minimum Validated dose needed for 4-log inactivation of Cryptosporidium (or UVDGM table 1.4 of specific microorganism log removal required for inactivation) according to LT2ESWATR under peak flow conditions. The basis for evaluating the UV dose and system design criteria for the UV system shall be in accordance to the manufacturer's third party validation base on USEPA UVDGM validation protocol, Nov. 2006.	
2) The validation process of the UV system must be done in the USA using the dose pacing validation, as specified in the USEPA UVDGM validation protocol, Nov. 2006.	
E. REQUIREMENTS / ACCEPTANCE CRITERIA	
The system should guarantee the following microbial load complying with the required minimum microbial parameters in the Philippine National Standard for Drinking Water.	

Parameters	Values
Total Coliform	< 1.1 MPN / 100ml
Fecal Coliform	< 1.1 MPN / 100ml
Heterotrophic Plate Count (HPC)	< 500 CFU/ml
E. Coli	< 1 CFU/ml

F. NECESSARY INFORMATION TO PROVIDE IN PROPSOSAL	
SUPPLIER'S EXPERIENCE Minimum of five (5) years experience of supply and operations of piped Ultraviolet Disinfection systems similar to this kind of project.	
EXCLUSIVITY CERTIFICATE Exclusive Distributorship Agreement	

G. ELECTRICAL CONTROL & CABLES	
• 5 UNITS CONTROL PANEL • 4 UNITS 15KVA AND 1 UNIT 5KVA DRY TYPE TRANSFORMER (STEP DOWN) DELTA-WYE CONNECTED COMPATIBLE WITH THE UV EQUIPMENT (PER UNIT) • 4 UNITS 16KVA AND 1 UNIT 6KVA AUTOMATIC VOLTAGE REGULATOR (AVR) • POWER CABLE TO THE MAINS - 5-wire flexible cable of 4mm.sq. each, 600V, HO7 RN-F 5x4 • CONTROLLER POWER CABLE TO THE MAINS – 3-wire 16AWG + shield flexible cable of 0.75mm.sq. each, 500V, HO5 RR-F 3G.075 • WIRING HARNESS – 10M, 1- bundle • POWER CABLES – Factory-installed Power cables, daisy chains all Connection Boxes. *NOTE: Calamba WD shall provide the Dedicated Electrical Infrastructure like Circuit Breakers.*	
H. PIPELINE, VALVE & FITTINGS: (SEE ATTACHED LAY-OUT)	
• 150mm, 350mm, 800mm spiral welded or seamless BI pipe	
• 6-pcs 150mm Butterfly Valve	
• 12-pcs 350mm Butterfly Valve	
• 1-pc 800mm Butterfly Valve	
• 1-pc 150mm mech./sleeve type coupling	
• 4-pcs 350mm mech./sleeve type coupling	
• 3-pc 800mm mech./sleeve type coupling	
• 1-unit 150mm electro-magnetic flowmeter	
• 4-units 350mm electro-magnetic flowmeter	
• 1-pc 150mm x 150mm x 150mm steel tee	
• 2-pcs 800mm x 800mm x 800mm steel tee	
• 1-unit 200mm Automatic Screen Filter	
• 4-units 350mm Wye Strainer	
• UV System Shed/Shelter (11m x 11m, 121-sq.m) concrete structure	
I. (CIVIL WORKS) UV SYSTEM SHED/ SHELTER (11M X 11M) with Complete Electrical Installation for lighting, convenience outlet and power supply for UV System (for 4X RZ300 – 12)	
1. FOOTING, COLUMN & BEAM Shall be Class-A concrete (3000psi) with grade-33 reinforcing steel bars	
2. WALLS Shall be 100mm concrete hollow blocks with grade-33 reinforcing steel bars & place cement plaster	
3. ROOFING Class-A concrete slab on-fill with grade-33 reinforcing steel	
4. FLOORING Class-A concrete slab on-fill with grade-33 reinforcing steel	
5. CEILING Suspended ceiling gypsum board with metal furring frame	
6. DOOR & WINDOW Swing glass door with aluminum frame. Window with aluminum frame.	
7. PAINT Column, beam, wall & ceiling-finished with masonry putty and semi-gloss latex paint Structural steel-paint with primer & anti-rush paint	
8. VENTILLATION Exhaust fans for UV Room and Airconditioning Unit for Electrical Room.	
9. PLATFORM & STAIRS Metal platform for easy access between units shall be made of angle bars, MS plate, and GI pipes	

J. MECHANICAL WORKS (PIPE, VALVES & FITTINGS)	
1. SPIRAL STEEL OR SEAMLESS BLACK STEEL PIPE (PIPE & FABRICATED STEEL FITTINGS, EPOXY-LINED, FOOD GRADE COATED) • Shall be fabricated from hot-rolled carbon steel sheets or plates conforming with ASTM A-570 Grades C, D, or E, ASTM A-283 Grade D; steel pipe conforming with ASTM A-139 Grade B; or, if approved by the Engineer, high-strength low-alloy steel conforming with ASTM A-572 Grade 42. Field welding of pipe and fitting joints shall conform with the requirements of the "AWWA Standards for Field Welding of Steel Water Pipe Joints" (AWWA C206). Prior to welding, the joint shall be made up in accordance with the approved coating. Such joints shall be inspected and approved by the Engineer before any protective coating is placed around the outside of the joint.	
2. BUTTERFLY VALVE • Valves shall conform with ISO 5752 (series 20)/ API 609/ BS 5155, BS EN593/ EN-558-1/(series 20) • Flanges shall conform with ISO 7005-2 PN 10/16 (EN 1092-2 PN 10/16), ANSI B16.1 class 125/ B16.1 class 150 • Max working pressure- PN 16, Coating- Epoxy min 80 micron UV resistance Disc : o Worthite/ Duplex/ Super Duplex/ SS 316/ UB6 o Ductile Iron Enamel/ Halar/ Rilsan coated o Ductile Iron rubber vulcanized EPDM/ NBR o Hypalon/ Buty • Tightness test shall be according to EN 12266-1:2003 with Material Cert: EN 10204.3.1 • MATERIAL SPECS: o Body shall be made of Ductile Iron/Cast Iron, shafting/axle shall be SS420/SS316/Duplex o Bush shall be brass / Reinforced nylon/PP and washer shall be Steel Galvanized. • O-ring NBR/EDPM	
3. SLEEVE TYPE COUPLING o Couplings shall be *ductile-type; bolt & nut must be hot-dip galvanized*, without pipe stop, and shall be of sizes to fit the pipe and fitting shown. The middle ring shall be not less than 6 mm (1/4 in.) in thickness and shall be 125 to 175 mm (5 in. to 7 in.) long for standard steel couplings, and 400 mm (16 in.) long for long-sleeved couplings. Bolts for exposed coupling shall be hot-dip galvanized.	
4. ELECTRO-MAGNETIC FULLBORE FLOWMETER *SUPPLY: 220 Volts *ENCLOSURE: IP 65 provided that the equipment will not be submerged to water based on the design otherwise IP 68 shall be required. *ACCURACY: ± 0.5% *TRANSMITTER DISPLAY: 2 LINE REMOTE DIGITAL OUTPUT: PULSE FOR DATA LOGGER CABLE LENGTH: 25 Meters with Military Specs CONNECTION: FLANGE TYPE PN 16	
K. CIP (CLEANING-IN-PLACE) • The CIP procedure consists of two parts: - Cleaning to remove the accumulated particles that collect on the quartz tube over time. - Disinfectant cleaning to sterilize the quartz tube - Estimated time for CIP process, 1.50 hrs • Recommended Cleaning Solution - Phosphoric Acid (H3PO4) 2% diluted solution - Nitric acid (HNO3) 2% diluted solution. - HCI 2% diluted solution – recommended for metal based (rust-colored) deposits	

- Sulfamic acid (H3NSO3) 1.5% diluted solution – recommended for calcium-based deposits As part of the Operation & Maintenance (O&M), special tools & equipment to be utilized in "CIP" shall be provided by the supplier as auxiliary of the UV equipment. It shall be turn-over to CWD after warranty period.	
L. ENGINEERING, INSTALLATION, COMMISSIONING & TRAINING • Project Management, Engineering & Supervision. • Manpower, Equipment, Tools & consumables for the complete system installation. • System Activation, Start-Up, Monitoring & Fine Tuning. • O & M training. • Continue supply of all spare parts & consumables, management, operations & and administration of the project through-out the warranty period of One (1) Year. • Monitoring and Evaluation of Technical Personnel.	
M. WARRANTY, GUARANTEE & PERIODIC MAINTENANCE SERVICE FOR ONE (1) YEAR (Supplier Responsibility) • Expenses for the laboratory test to be conducted by DOH-BFAD accredited laboratory together with the representatives of CWD with parameters under **Item E,** as Acceptance Criteria Requirements. • *Warranty period (1 year after commissioning)* • Any defect in the unit shall be in the expense of the supplier (labor & materials). Materials & Technical Staff must be available anytime. **AFTER SALES SERVICE (Within the minimum lifespan of the equipment after the warranty period) – 10 years** • Availability of spare parts, consumables, and technical support within the life span of the equipment (expenses shall be shouldered by Client)	